PEST TECHNOLOGY
Pest Control and Pesticides

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CONTENTS

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LET'S BE FRANK!

RECENTLY we wrote a letter to all the firms manufacturing pesticides, requesting them to supply us with details of their products and the active ingredients of each one. The response to the letter has been excellent and the vast majority of firms have supplied us with all the information that we required. It was pleasing to note that, in accordance to the recommendation of the Association of British Manufacturers of Agricultural Chemicals, many of the companies are now declaring the active agent of a product in the sales literature and on container labels. In any case the constitution of a compound must be declared before it can be considered for the M.A.F.F.'s Crop Protection Products Approval Scheme.

Unfortunately there are still one or two firms who maintain that the active agents in their products must remain ' secret ' as the British Patent Laws, whereby only a formulation can be patented but not a chemical, afford them no protection. They may have a point with regard to the Patent Laws but surely they know by now that their secrecy gives them as much protection as Floyd Patterson's defence gave him against Ingemar Johanssen's right.

A technical department or group could easily obtain a sample of pesticide even if they had to purchase it at retail price, then by using modern analytical techniques and by consideration of the data, (such as pest species controlled, crops on which the product can be used, and whether the product is scheduled poison etc.) given on the sales leaflets etc. they could determine the active ingredient or at least get as near as makes no difference. Consider, another factor, before a product is released onto the market it will be investigated by the firm's scientific staff. Quite often they will have presented papers, concerning their research work, to certain academic journals or have read them at meetings or symposia, therefore, the results of their investigations will be known by other scientists before the product is introduced onto the market. The whole point, is, of course, the fact that the scientists who are most likely to be ' in the know ' are those who are in the pest control field and who are quite likely to be employed by other firms manufacturing pesticides. It is their firms which are the more likely to offer competition. So much then for ' secrecy '.

We realise of course that, in the case of an entirely new product, there may be logical reasons for not broadcasting details right, left and centre, but there is no use pretending that the constitution of a product is ' secret ', when it has been marketed overseas for some time. In this respect, perhaps, the greatest insult to one's intelligence occurred at the Smithfield Show when a certain firm, fortunately not usually associated with the marketing of pesticides, was distributing a formulation of a well known weed killer. It was pointed out that there was no mention of the active agent on the sales leaflet, whereupon it was stated that the active agent was highly secret and could not be divulged. However, another firm were also distributing the same formulation, and full details were printed upon the sales' leaflets and upon the cans containing the product. Moreover this same formulation although it had only recently been marketed in Britain, had been in use in the U.S.A. for some 3 years or more.

(*Continued on page 123*)

PUBLICITY for PESTICIDES

By now readers of this journal will be fully aware of our campaign for more publicity on behalf of agricultural chemicals and for more propaganda to bring home to the general public the fact that they play an invaluable part in raising our standard of living by improving the quantity and quality of our food. In the United States, where the Agricultural Chemicals Industry is rather more publicity conscious than its British counterpart, a constant stream of literature is produced to convince those wishing to put a red flag in front of every scientific advance, that their attitude is mistaken and that there is an insignificant proportion of qualified evidence to support their exaggerated beliefs.

We publish here two samples of this literature and ask if this is the type of publicity required in this country.

The first article, originally entitled "Do Pesticides Cause Disease" was presented by the author at the Symposium on Pesticide Residues in Meat and Milk, Pesticides Subdivision, Division of Agricultural and Food Chemistry, American Chemical Society, held in Atlantic City, New Jersey, September 1959. *Readers will note that it is intended for the scientifically educated or those who can discuss a subject without jumping to hysterical conclusions. The second article, represents the text of a statement issued by the National Agricultural Chemicals Association (of America) following the recent Cranberry Scare—which incidentally was due to herbicides being used contrary to the manufacturers' instructions—in that country. This article is obviously intended for the general public. It is not a discussion of the problems involved but a simple statement intended to reassure the man in the street.*

We believe that the British Agricultural Chemicals Industry can find a place for both types of presentation but more so for the latter, especially when one takes into consideration the fact that the tests which a pesticide must pass before it can be released on the U.K. market are probably more stringent than those imposed by the Federal Food and Drug Administration of America. However, readers will no doubt judge the value of these articles for themselves.

PART I ——————

RESIDUES—A MEDICAL APPRAISAL *

By MITCHELL R. ZAVON, M.D. (*Assistant Professor of Industrial Medicine, Kettering Laboratory College of Medicine University of Cincinnati, Cincinnati, Ohio*).

THERE are long lists of documented cases of accidental exposure to pesticides but those that might result from ingestion of milk or meat are of a different order of magnitude. Residues measured in parts per million or even parts per billion cannot be presumed to produce the same syndrome as an exposure measured in grams or kilograms. Nevertheless pesticide residues may produce an effect and such a possibility cannot be denied. A Study Group of the World Health Organisation[1] has made the statement "With any new compound there exists the very real possibility that repeated exposure will produce in men an acute or chronic disease which did not occur or was not recognized in the studies on experimental animals".

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Though this possibility exists and must be continuously looked for and guarded against, this should not stampede us into unwarranted and improbable assumptions. Accusations are often aired in the public press of deleterious effect resulting from such residues and have tended to set a stage in which the protagonists become political or ideological opponents rather than scientific seekers after truth. *Post hoc* reasoning has been used as a scientific argument and obscured the necessity for careful inquiry into the very proper questions being asked.

An Approach to the Question

There are a number of ways in which we can look for an answer to our question. Let us look at each in turn in order to test its feasibility, ascertain whether it has been tried, and evaluate the results, if any.

Animal Experimentation

Prior to the introduction of a pesticide for use in agricultural operations, the material is fed to animals for periods of as long as two years. Two years is a short period in the life span of man but the major part of a lifetime of a rat and a very significant portion of the life span of a dog. Deleterious effects resulting from such feeding experiments rule out the material as a commercial possibility. Therefore, the fact that a pesticide is used and may end up as a residue in meat implies that no detectable effects were found after prolonged ingestion by experimental animals at levels at least 100 times the highest expected level in food. The question can be asked, are our methods of observation sufficiently acute to detect damage. There is always a possibility that they are not. But if an animal is able to live out its normal life span without evidence of damage, any effects below the level of our observation are probably not of much significance.

There is another possible direction in which we might direct our animal experimentation. By exposing the animal to the pesticide and simultaneously subjecting the animal to one or more other insults we would increase the possibility of an effect. Some work along this line has been done with materials other than pesticides. It is a possible type of methodology but raises the spectre of interpreting the results, if any, in the light of man's own experience.

Though we use animals as experimental subjects and attempt to spare man any risk we always recognize that effects found in lower animals may not occur in humans and lack of effect in the lower animal is no guarantee of lack of effect in the human. Animal experimentation has not and cannot answer our question conclusively in either the negative or the affirmative. Such experiments can only give us direction signals. In answer to our present question, animal experimentation has indicated a lack of effect.

Observation of the Human Subject

The United States Public Health Service[2] examined a large number of persons exposed to lead arsenate in the year 1937. These people had been exposed either as consumers of fruit or workers in the orchards of Wenatchee, Washington. No evidence was found that ill health was any more prevalent in that region than elsewhere nor that any cases of chronic disease had been caused or influenced by lead arsenate exposure.

Ortelee[3], reporting in 1958, found no correlation between prolonged intensive occupational exposure to DDT and the frequency or distribution of clinical abnormalities. Hayes[4], in his now classical experiments, fed a diet containing a known quantity of DDT to a group of human volunteers. In this prolonged and carefully controlled study, using quantities of DDT well in excess of that to be found as a food residue, he found no evidence of disease caused by the exposure to the pesticide.

The type of study referred to is difficult, time consuming, and very costly. Observations on individuals suffer from the deficiencies inherent in all clinical observation and are compounded by the changes in observer personnel over a period of years. The studies cited held these deficiencies to a minimum, continued observations for a period of one or more years and included large groups of people. No harmful effects could be observed from exposure to the pesticides. Obviously, all pesticides that might be found as food residues have not been screened in this fashion. It would be a herculean task to do so. If we can perform such experiments on representative members of each group of compounds we will have partially, at least, answered our question. The published results of such work with the chlorinated hydrocarbons, and unpublished results of work with organophosphorus compounds are both negative.

Studies of Population Groups

A third possible approach to this problem is the statistical evaluation of reported illness and death, usually referred to as the epidemiologic method. When large groups of the population are exposed to a new factor in the environment this approach is often best for obtaining an indication of possible ill effects. Detailed clinical studies can then attempt to confirm or refute the suggestion obtained by way of the epidemiologic method.

A study of the effect of pesticide residues using epidemiologic methodology is complicated by a number of unresolvable factors. The numbers of different chemicals with which we come in daily contact has multiplied beyond imagination since the turn of the Century. How do we separate out the effect, if any, of pesticide residues from the effect of other chemical and physical agents present in our environment? To single out a chemical compound or even a type of usage and prove that this

compound or use causes an increase in some disease or disability becomes an extremely difficult task.

Assuming that we could separate the effect of pesticide residues from the effects of other chemical and physical agents in our environment, we must then attempt to compare morbidity and mortality statistics for the present with the period prior to the introduction of the large scale use of pesticides. We might use the years 1900 and 1956. If we could show a significant difference in causes of death between 1900 and 1956, a difference which had some conceivable relationship to a change in the environment, we might then be able to design studies to prove or disprove the validity of our assumption. Unfortunately there appears to be insurmountable difficulties in the way of such a comparison. Differences in the revisions of the International List of Causes of Death make direct comparison of data almost impossible if these two reference years are used. To use a date later than 1900 would invalidate our comparison.

Statistics Evaluated

Admitting that we are unable to make a valid comparison, let us look at the 1956 statistics[5] and attempt to evaluate some of the changes in cause of death that have occurred over the years.

The ten leading causes of death of white males in the United States in the year 1956 and the number per 100,000 population are as follows:

1.	Diseases of the heart	443.
2.	Malignancy	162.5
3.	Vascular lesions of central nervous system	102.3
4.	Accidents	76.9
5.	Certain diseases of early infancy	40.1
6.	Influenza and pneumonia	29.5
7.	General arteriosclerosis	19.6
8.	Suicide	16.9
9.	Cirrhosis of liver	14.7
10.	Congenital malformations	13.7

You will note that the first three categories are for types of disease usually, but not exclusively, associated with ageing. The increase in life expectancy has been accompanied by an increase in the degenerative diseases to a position as a leading cause of death.

It is impossible to single out any simple reason for an increase in a particular cause of death. Probably the most valid reasons for the shift that has occurred in this Century is the greater age at time of death and the decrease in infectious disease. Simultaneously accidental death has become a serious problem. Though accidents are now the fourth greatest cause of death in the United States it is probable that in actual fact deaths per 100,000 of population due to this cause have actually decreased. We are unable to muster any reliable evidence that the leading causes of death have been influenced by pesticide exposure in food or otherwise. For every shift in position

of a particular cause of death there are a multitude of explanations most of them far more reasonable than the possible exposure to trace quantities of pesticides.

Malignancy is now the number two cause of death. If an item of diet were the cause of an actual increase in malignancy we would expect the increment to be divided equally between the sexes. We are aware that smoking habits differ between men and women but there is no obvious differences in types of food intake. Changes in the mortality from different types of malignancy have not been divided equally between the sexes. In some instances in recent years cancer mortality rates have decreased but by-and-large any changes in mortality rates are attributable to improved diagnosis and treatment. One exception to the previous statement should be noted. It is difficult to get comparable figures but it appears reasonably certain that there has been an absolute increase in leukemia since the turn of the century. At present there is considerable feeling that this increase is partially due to the increase in radiation exposure of much of the population. We have no evidence that other environmental factors have the same leukemogenic potentiality as ionizing radiation.

Illness is not reportable except for a number of specific diseases. The data available is insufficient to even attempt to correlate morbidity with changes in the chemicals available in the diet.

Cause and Effect

Three possible methods of approach to the question "do pesticides cause disease" have been described. Each has been tried. In each case the answer has been in the negative or the method has been found wanting. Before we can design an experiment which will attempt to answer the question there are a number of preliminary questions which must first be answered.

1. How much pesticide residue is there in milk and meat?
2. What chemical form do these residues take?
3. How much of the residue is present after food preparation?
4. How much of residue is ingested?
5. How much of the residue is excreted unmetabolized or metabolized without effect?
6. How much of the residue remains in the human body?

The answer to question one is known. As we proceed down the list our knowledge becomes more and more fragmentary, yet if we wish to determine whether or not pesticide residues cause harm to people we must have some idea of how much they actually ingest, how much they retain, and what happens to the material in the body. Too much of the discussion of the effects of pesticide residues has proceeded on the assumption that the amount found on the farm or in the meat market or produce dealers shelf is the amount actually ingested. Food preparation may markedly alter the amount of residue. Habits of food intake may also affect the intake of pesticide residue. Pesticides which are primarily deposited in the fat may be ingested by the person who eats the fat on meat but would barely be touched by the person who trims away all visible fat.

Developing Data

In order to develop good clinical data we should set up two population groups. One group would consist of people with an aversion for fat and a second group would consist of people who eat the fat. We would have to insure that most other factors were identical and we would want analyses of duplicate samples of all food and drink in order to know exactly what the exposure has been. Of course we would have to analyse all excreta in order to gain an idea of how much pesticide has remained in the body. Following these two population groups for a period of at least 20 years might give us conclusive data. Assuming that new information during that interval did not invalidate our assumptions and methodology, we might by diligent clinical and laboratory examination determine whether or not pesticide residues had an effect.

Lack of Effect Noted

The approach described is obviously more difficult than *ex cathedra* statements without basis in controlled observation or experiment. Until such an experimental approach shows positive results we must rely on the work done to date, all of which has indicated a lack of effect from pesticide residues of the order of magnitude found in the United States.

Based on his extensive experience Hayes[6] has written, ". . . the repeated suggestion that DDT is the direct cause of a virus-like disease and of a psychoneurotic syndrome and is a contributing cause of poliomyelitis, hepatitis, cardiovascular disease and cancer, as well as a formidable array of animal disease finds no support in animal experiments or in human morbidity or mortality statistics". Similar statements about other commonly used pesticides are equally without foundation. To assume that pesticides can cause aplastic anemia, leukemia, lymphoma or any other disease because pesticides are now widely used and more cases of these diseases are seen, is the purest form of non-objective reasoning. Such reasoning is performed under the conditions described by Menkes[7] in a recent article and bodes ill for the future if it becomes fashionable.

Population Comparisons

In order to detect damage resulting from pesticide residues in milk and meat we should first have some idea of what to look for. In the absence of such a lead we can try to compare an exposed population with an unexposed population. Due to other variables such a comparison is now impossible.

Beyond specific toxic reactions, most of the human ills customarily listed as possibly related to environmental factors can be attributed usually not to one but rather to an assortment of etiological agents, biological and physical, as well as chemical. These may act singly, in combinations or synergistically and often antagonistically. Furthermore, the relationship of the exciting causes to both acute and chronic disease may be secondary as well as primary, since these agents may also aggravate or accelerate pre-existing conditions.

Evidence Absent

To complicate the picture even more (and fortunately for his well being and survival) man, within certain limits, is both resistant and resilient. But this ability to adapt to the environment and his vulnerability or susceptibility to noxious contacts differs greatly with race, sex, age, state of nutrition and other like variables. Accordingly, health and disease can never be defined in terms of lesions or clinical reactions but rather visualised as the capacity of the individual to function in an acceptable fashion at any given moment. In the absence of evidence indicating an effect the burden of proof is upon those who claim that pesticide residues cause illness. No such proof is now available.

Conclusions

1. No deleterious effect has been shown to result from pesticide residues in milk and meat.
2. Until our methods of clinical evaluation become far more refined we will probably be unable to detect effects from the residues presently found.
3. At present there is no evidence of effect from long term ingestion of the residues of pesticides in milk and meat.
4. Quantitative studies to determine the actual exposure of the human organism to pesticide residues would be highly desirable.

References

[1] Toxic Hazards of Pesticides to Man. Report of a Study Group. *Technical Report Series, World Health Organization No.* 114, (Oct. 1956).

[2] Paul Neal, et. al., A Study of the Effect of Lead Arsenate Exposure on Orchardists and Consumers of Sprayed Fruit. *Public Health Bull. No.* 267, (1941).

[3] Ortelee, Mark F.: Study of Men with Prolonged Intensive Occupational Exposure to DDT. *Arch. Ind. Health* **18:** (5 Nov. 1958), p. 433.

[4] Hayes, W. J., et. al.: The Effect of Known Repeated Oral Doses of Chlorophenothane (DDT) in Man. *J.A.M.A.* **162:** (October 27, 1956).

[5] Vital Statistics of the United States—1956.

[6] Hayes, W. J.: Present Status of Our Knowledge of DDT Intoxication. *Amer. J. Public Health* **45:** 478-85, (April, 1955).

[7] Menkes, J. H.: Progressive Non-conformism in the Lateral Geniculate Nucleus of Man. A Problem in Competence. *Lancet* II: (1958), p. 1368.

Author's Note.

Dear Mr. Palmer,

. . . . It might well be noted as an addendum to the original article, though I should prefer that you use your own judgment as to whether to include it or not, that I have been quite pleased with the response which this paper received. It is interesting that despite the protestations of those engaged in animal experimentation to the effect that their's is animal work and cannot be directly extrapolated to humans that quite the contrary is actually the case. Much of the animal work that is done is extrapolated to human beings either by inference or by a sort of subconscious reasoning process. If we are to maintain some sense of objectivity it is essential that our approach be reoriented in order to once again assert the primacy of human experience. Despite the difficulties inherent in human observations, the current course which largely neglects careful human observation in favour of large numbers of animal observations can only lead to increasing difficulty. Though observations of humans are acknowledgably difficult, it must be begun and expanded. Only as we get leads from the human can we do intelligent work with animals. When we allow hysteria to govern the direction of scientific inquiry we have lost the greater part of the battle. To a certain extent this is now the case and the situation must be changed.

Sincerely yours,

Mitchell R. Zavon, M.D.

WEEDS and WEEDKILLERS

By N.A.C.A. of America

WEEDS are the thieves and gangsters of the plant world. They steal water, food and sunlight from desirable plants. Some poison livestock and cause diseases in men. One—the African witch weed—actually kills corn and other grass plants by feeding on their roots.

Weed Losses

Weed damage turns up in big figures on the farm balance sheet. USDA estimated in 1952 that weeds cost farmers $4 billion a year. That is nearly $1,000 per farm family per year. One reason for this high loss figure is that many farmers are not yet controlling weeds by the most efficient methods.

Prior to 1944 the usual methods for controlling weeds in crops were machine cultivation and hand hoeing. A few chemicals were available to control weeds in a few crops, but hand weeding was the normal method. The "man with the hoe" was often used as a symbol of the typical farmer, and long hours of backbreaking toil went into the use of this farm tool.

New Weed Killers Discovered

What changed the need for hand hoeing was the discovery of hormone-type selective chemical weed killers in 1944. Selective weed killers usually kill either broad-leaved weeds or grasses, but not both at the same time. Thus, it is now possible to eliminate broad-leaved weeds among grass plants or grassy weeds from among broad-leaved plants by the use of the proper chemicals. Since selective chemical weed killers were introduced to agriculture around 1947, the "man with the hoe" has been replaced as a symbol of agriculture. Today it is possible to kill as many as 20 million weeds in an hour in many crops with tractor-drawn spray equipment.

Non-selective chemical weed killers, of course, have been available for many years. With these it is possible to rid any given area of all vegetation. Non-selective weed killers have gained wide use in keeping railroad tracks, industrial areas, space around farm buildings and areas under highway guard rails clear of weeds.

Both selective and non-selective weed killers have found uses in clearing brush, weeds and even some trees from land so it can be reclaimed as pasture or for farming. Others have been developed to rid canals, ponds, irrigation and drainage ditches of aquatic weeds.

As new weed killers have come into use, weeding costs have gone down. Labour time freed from the chore of hand weeding has been put to more productive use on farms, and around the home. Maintenance of beautiful lawns and highway roadsides has been made easier. Many recreation areas have been opened up as the result of chemical eradication of poisonous plants, brush, and aquatic weeds.

How Weed Killers are Safety Tested

How safe are chemical weed killers? Detailed research is carried out to determine this. And it follows logical stages.

Research on toxicity begins as soon as a compound is found to have any potential use. The earliest tests are on acute toxicity to animals and humans. For the first thing scientists must know is whether the compound is safe for use in further experiments.

If the compound passes the early tests for safety and effectiveness, safety research goes into a new state. It discovers what kind of mammalian injury might be expected from exposure to significant amounts of the compound over an extended period of time. These studies are known as 90-day feeding tests. They are conducted on laboratory animals. Minute studies are made of the animals to determine what effects, if any, the compound has on organ systems and the skin. This provides information to be needed during manufacturing and handling of the material.

Test Studies Expanded

When field testing begins, extensive studies are made of residues, if any, which are left on food crops. At the same time studies are made of biological effects on mammals. These determine whether the chemical is absorbed into the body, how much is absorbed, and what effects it has, if any.

The final step in evaluating a new weed killer involves large scale field testing. Long term toxicity tests are carried on at the same time. These are carried out on a variety of laboratory animals and continue over the normal life span of the animals. Test animals are

observed constantly to determine absorption, excretion, and any biological changes that may occur. Such testing may run two or three years or more.

During this lengthy period many different scientists have tested the compound and have learned what happens when the material is inhaled, when it touches the skin, when minute amounts of residues are consumed. These are tough tests for the compounds. And many more are flunked out at the different stages of research than are promoted to advanced stages of study.

On the average from 300 to 2,000 different compounds must be tested for every new chemical weed killer which is found. Finding the one chemical which will do a better job is more challenging than finding a needle in a haystack. And it is much more expensive. Three to five years goes into the search to find a single new weed killer. The cost ranges from about $700,000 per new chemical in a few cases to $1,500,000 or more in most cases.

FDA Sets Tolerances

When a chemical weed killer is to be used on food crops, all the data collected over three to five years work is checked by Federal Food and Drug Administration scientists against work done in their own FDA laboratories.

Then a safe level for residue of the chemical (called a tolerance) which may remain on a crop at the time of harvest is set by FDA. If the amount of residue left on a crop by good agricultural practice is less than the safe level as is often the case, the lower level is established as the legal level of residue that may remain in or on a crop.

The tolerance level may be 100 parts per million, or it may be as low as 1/10th part per million, depending upon the scientifically established effect of the chemical. 1/10th part per million is equal to the thickness of a strip of cellophane compared to the height of the Washington Monument.

No products in use in the world today—not even pharmaceuticals—are more thoroughly tested before they are sold or used. And the results of all this research is available for everyone to read—on the labels of the containers.

Nothing is left to chance. All the testing and checking is done before the product is put on the market.

(*Note:* 1 dollar = 7s. 2d. approximately.)

FARMING TECHNIQUE AIDS BIOLOGICAL CONTROL

IN *California Agriculture* 14, 1, it is reported that a loss of $11 million ($ = approx. 7s. 6d.) worth of the California alfalfa crop can be avoided by combined biological and chemical control methods.

In 1955 the spotted alfalfa aphid, *Therioaphis maculata* (Buckton) caused damage to the alfalfa crop, amounting to $2 million due to the importation and colonization of three species of wasp parasites, conservation of indigenous natural enemies of the aphid, and the use of effective insecticides.

From studies of alfalfa insect problems during the period 1956-59, E. I. Schlinger and E. J. Deitrick have found that biological control can be further aided by a strip-farming programme designed to conserve the natural enemies of the insect pests. The conservation of these pest predators and parasites results in the pest species being maintained below the economic level throughout the whole year and minimizes the need for applying any kind of insecticide.

Strip-farming is essentially the harvesting of alternate strips so that when each set of alternate strips is cut, the other strips are about half grown and the field is never completely bare of hay, thus a reliable population balance between the different insect species can be retained in a given field.

Methods

In one set of the trials a 70 acre field was divided into two equal parts, the first being prepared for regular-farming whilst the second was set aside for strip-farming. Insect populations in both sections were sampled by the conventional sweep-net method and by sectional collecting machine. The latter technique proved to be far superior to the sweep-net method and the results were consequently assessed from the machine samples. Altogether 45 square feet of alfalfa were sampled every fortnight and all the arthropods collected were sorted and counted. From February to September, 1959, approximately 250 species were found in the alfalfa.

Readers are invited to submit original articles, constructive criticism and comment. Correspondence will be carefully scrutinised and, wherever possible, published.

Effect of Strip-Farming on Fauna

Most, if not all, of the pest or potential pest species present, responded to the strip-farming method in the same manner as did the two most important pest species —the spotted alfalfa aphid and worms—and their natural enemies which include 3 species of lady beetles, 2 species of green lacewing larvae, 3 species of hover fly larvae, 3 species of imported internal wasp parasites, 2 species of big eyed bugs, 2 species of damsel bugs, 2 species of pirate bugs and 4 species of aphid-eating spiders. It was discovered that four times as many natural enemies of aphids were produced in the strip-farmed alfalfa as were produced in the regular-farmed alfalfa, without producing economic infestations of the spotted alfalfa and pea aphid.

At times during the year both sections had a similar natural enemy/aphid ratio. However, at other times for example June to July the spotted alfalfa aphid was a serious problem in the regular-farmed field and great damage occurred. Yet in the strip-farmed section the ratio of natural enemies to the aphid remained favourable and no economically important damage occurred.

The worm population which constitutes the second major hazard to alfalfa suffered in a similar manner to the aphid population and twice as many parasites and predators of worms were found in the strip-farmed section as compared with the other. The total numbers of worms in both sections were often similar. However, the worms in the strip-farmed alfalfa never developed to maturity or caused economic damage to the alfalfa, simply because of the better ratio of natural enemies to the pest. On the other hand, worms in economic proportions did develop to maturity in the regular-farmed field and caused considerable loss of alfalfa.

Yields

Yield records showed that the strip-farmed field produced 3,942 bales of hay, while the regular-farmed field produced only 3,360 bales, nearly 15% less than the strip-farmed field.

The result indicates that further investigations into crop husbandry techniques may well be worthwhile, for those crops in which biological control methods can be used.

LETTER TO THE EDITOR . . . .

Dear Sir,

We notice in your issue of January, 1960 in the section devoted to the Smithfield Show, a very good picture of our Microsol Model 303T Mechanical Fog Generator, plus an accurate and excellent description.

Unfortunately, however, you have made the mistake which a number of people are inclined to make when insufficient information is supplied, that is you have described Gordon Felber & Co. Ltd. as the distributors for this machine. This is inaccurate, as the machine is only sold by Gordon Felber & Co. Ltd. on the non-exclusive basis in the animal husbandry and certain parts of the agricultural industry.

In point of fact, the Microsol 303T, which was designed and produced by ourselves, is sold by ourselves throughout industry and by a number of other Companies, including Cooper, McDougall & Robertson Ltd., the well-known chemical manufacturers.

This matter is brought to your notice as it seems improper that the impression should be given that one firm has distribution rights on this particular part of our range of equipment and we should be grateful if you would see that this is corrected in a future issue of your excellent magazine.

The only other point we feel we might make, is that capacity of the tank of the Model 303T is 5 gallons and not 4 as stated in your report.

May we, at the same time, say how interested we were to read the paper by A. A. Green and Joyce Kane of the Pest Infestation Laboratory about the protection of stored cocoa against warehouse moth. This technique is one which we have advocated and now for three or four years and is working in the practical sense in a very large number of warehouses throughout the world, both in regard to cocoa storage, tobacco and for other specialised storage problems.

It seems to us that the whole essence of the matter is contained in the last sentence of the paragraph headed "Conclusions". This states that successful control can be achieved only by the conscientious application of suitable spraying techniques. We agree with this because it is obvious that the cost of labour must be a high factor in any such programme and it is our good fortune to have evolved a system, using our Microsol Mechanical Fog Generators, which allows such spraying techniques to be employed at low labour cost and with no waste of insecticide. They also ensure, of course, that the whole of the fabric of the building, plus the outside of all the stored products is covered with the film of suitable insecticide.

We trust this matter will also be of some interest to yourselves.

Yours faithfully,

KENNETH W. HOLE,

Silver Creek Precision Ltd. *Managing Director*.

LET'S BE FRANK . . . . *continued*

There is another matter on which we would like to air our views, again it concerns the reticence of the agricultural chemicals industry, to release information. We have been told time and time again that we are on the mailing list of all firms in the industry, and they have promised faithfully to send us information and news of their activities. Unfortunately it appears that this industry is the least publicity conscious in the country, and to judge by the lack of news it appears as though it is at a standstill. However, we know that this is not the case, for when we come into contact with these companies we hear of staff changes, expansions in trade, agreements being reached with other companies for reciprocal marketing of products and various other tit-bits which would be of interest to others both in industry and customers of the industry, but in the majority of cases we only hear of these things on the grapevine and not from official sources.

Why is the Agricultural Chemicals industry so lax in sending us news of their activities? We know that news items published in *Pest Technology* can bring results and several firms have received business enquiries from various parts of the world following the publication of a news item in our columns. So to all the firms in the industry, research stations and anyone concerned with pest control we say, please send us news and comment, it can't do you any harm and it may do you some good.

Don't be backward in coming forward!

BORON COMPOUNDS for the PRESERVATION OF TIMBER against FUNGI AND INSECTS *

By W. P. K. FINDLAY, D.Sc., A.R.C.S., D.I.C., A.I.T.C.A., M.I.Biol.

IT has long been known that compounds of boron possess antiseptic properties and formerly boric acid was used extensively for the preservation of dairy products. Many years ago solutions of borax were used for preventing sapstain on hardwoods and were employed as fire retarding treatments, but it is only in recent years that the high toxicity of boron compounds to wood rotting fungi has been fully understood. The relatively poor performance of boron treated wood in field exposure tests, where the treated wood was exposed to severe leaching, gave an erroneous impression of its toxicity to fungi. The neglect of boron as a potential wood preservative is thus understandable. Formerly, the wood preserving industry was concerned almost exclusively with the preservation of railway sleepers, poles, fencing and marine piling, for which purposes boron compounds are not entirely satisfactory, because they would in the course of time leach out of the wood. Even so Blew[1] et al. (1949) found that impregnation of poles with 1 lb./cu. ft. (about 16 kgs./M^3) of borax increased their life to 16-21 years compared with a life of 6-7 years for the untreated controls.

The recent interest in the use of boron for wood preservation arose from investigations carried out independently in Australasia and Princes Risborough. Just before the war, I was looking for a non-poisonous and odourless preservative that could be used on woodwork of cold stores and of all the substances tested borax appeared to be the most promising. The results of these laboratory tests were published much later showing that impregnation of pine or beech wood with solutions of borax giving retentions of about 1.5 kgs./M^3 effectively protected it against a wide range of test fungi. See table 1.

The toxicity of boron to Lyctus beetles had been established before 1939 in the C.S.I.R.O. laboratory in Australia[3] and the successful treatment of veneers for plywood and of solid timber with boron, applied by a diffusion treatment, has now been carried out on a commercial scale for many years.

In the States of Queensland and New South Wales timbers susceptible to *Lyctus* and plywood made from such woods must now by law be treated with a wood preservative and the use of boron compounds for this purpose is officially approved. In 1957 over 1,000 tons of these chemicals were used for the preservative treatment of sawn timber and veneers in Australia.

The New Zealand workers realised that the preservation of building timbers which are protected against leaching by a roof or by paint, presents an entirely different problem from the preservation of railway sleepers and poles. It is not necessary to achieve any high degree of fixation if the treated wood is never to be exposed to leaching. For the preservation of building timber other properties such as the absence of any toxicity to man and domestic animals may be equally if not more important. Let us examine some of the published evidence for the high toxicity of boron compounds firstly to wood rotting fungi, secondly to insects.

Harrow[4] (1950) using the wood block method with soil found the toxic limits to be:

Boric acid 2.0—2.7 kgs./M^3.

Sodium fluoride about 4.3 kg./M^3.

Baechler and Roth[11] (1956) found the toxic limits for sodium borate in pine sapwood against 3 test fungi to be somewhat lower than those for sodium fluoride and in oak to be very much lower. See table 2.

The results of soil block tests carried out by Carr[12] on a number of wood preservatives are given in table 3.

The results of all the laboratory tests that have been carried out in a number of independent laboratories show beyond doubt that boron is highly and uniformly toxic to all the common wood rotting fungi, the toxicity of borax being somewhat greater than that of sodium

* *A paper originally presented to the 6th Wood Preservation Congress of the German Society for Wood Research in July, 1959.*

fluoride. No fungi have been found to be unusually resistant to boron in the way that *Poria spp.* are resistant to copper or *Lenzites trabea* to arsenic.

Now let us consider the evidence for the toxicity of boron to insects. As long ago as 1938 Cummins and Wilson[5] were able to show that effective protection against *Lyctus brunneus* was obtained with a concentration of sodium metaborate as low as 0.04 lbs./cu. ft. (=0.67 kgs./M^3). In 1939 Cummins[6] concluded that the lethal concentration of boron to *Lyctus brunneus* was about 0.12% boric acid (equivalent to about 0.02% of boron) based on the oven dry weight of the wood.

Spiller[7] (1948) found boric acid to be very toxic to the larvæ of *Anobium punctatum*, a boric acid content of 0.04% giving complete kill. Later[8] (1950) he found this chemical similarly to be very toxic to the larvæ of the Longhorn borer, *Ambeodontus tristis*, a concentration of 0.092% giving a complete kill. Tests at F.P.R.L. Princes Risborough (Annual Report for 1956) confirm that boron is toxic to *Hylotropes bajulus*. No larvæ survived in wood containing 2.4 mg./c.c.

So far as termites are concerned, we have evidence of the effectiveness of boron against certain species. From West Africa it has been reported[9] that wood treated with 1.0% borax, i.e., containing 6-7 kg./M^3 was unattacked by *Cryptotermes*. Australian experience[10] suggests that a boric acid content of 0.5% (on weight of wood) gives reasonable protection against termites. It would seem that those termites such as *Cryptotermes* which possess a rich intestinal flora of *Protozoa* are probably more susceptible to boron than those termites which do not depend on *Protozoa* for digesting cellulose.

Permanence of Boron in Wood

Boron compounds used for timber preservation are not volatile, therefore loss of these preservatives can take place only by leaching. This can occur to a serious degree only when the treated timber remains wet throughout its cross section for a long period. Such a condition very rarely occurs in buildings and temporary exposure of boron treated wood during the construction of a building has never been found in practice seriously to reduce its content of preservative.

Effect of Boron Treatment on Properties of Wood

While it is true that long and continuous contact with the strongly alkaline borates that have been used to make wood fire resistant do tend to make hardwoods slightly brittle, the more or less neutral solutions used for wood preservation have no such deleterious effects.

There is no evidence that impregnation with borax affects any paint or varnish that may be applied to the treated timber after it has been dried.

Boron treated wood may be glued quite satisfactorily with urea-formaldehyde and resorcinol glues without any loss of bond strength, but there is some evidence to show that phenolformaldehyde glues are affected by boron treatment.

TABLE 1
'The Toxicity of Borax to Wood-Rotting Fungi'
Results of Tests (European Wood Block Method)

Test Fungus	Timber	Toxic Limits: Minimum concentration of commercial borax (hydrated) inhibiting attack		
		As conc. of treating solution	*As conc. in wood*	
First Test Series		per cent.	Kg/m^3	$lb./ft.^3$
Lentinus lepideus	Scots pine sapwood	0.1	about 0.5	0.03
Coniophora cerebella	,, ,,	0.2	,, 1.0	0.06
Poria vaporaria	,, ,,	0.1	,, 0.5	0.03
Polystictus versicolor	Beech ,,	0.1—0.2	below 1.0	0.06
Second Test Series				
Merulius lacrymans	Scots pine sapwood	below 0.25	below 1.6	below 0.1
Poria vaillantii	,, ,,	,, 0.25	,, 1.6	,, 0.1
Lenzites trabea	,, ,,	,, 0.25	,, 1.6	,, 0.1
Trametes serialis	,, ,,	,, 0.25	,, 1.6	,, 0.1
Poria xantha	,, ,,	,, 0.25	,, 1.6	,, 0.1
Polyporus ragulosus	Beech ,,	just over 0.25	just over 1.5	about 0.1

Methods of Applying Boron Compounds to Timber

Boron compounds can be applied to timber by the ordinary vacuum-pressure method using conventional treating plant, but this method required the timber to be dried before impregnation so as to provide space in the wood cells for the fluid to enter the wood. There are many species such as Douglas fir and spruce that are resistant to pressure impregnation even when fully seasoned. For these reasons, the New Zealand workers investigated the possibility of treating freshly felled unseasoned timber by a diffusion treatment for which the presence of sap is essential. Freshly sawn timber is immersed in a strong solution of boron compounds for a length of time that is a function of the thickness of the timber and the concentration of the solution. By carefully adjusting the proportion of sodium borate to boric acid very highly concentrated solutions can be prepared.

Convenient ratios are:

Decahydrate borax 1.54 parts by wt.
Boric acid 1.0 part by wt.
or
Pentahydrate borax 1.18 parts by wt.
Boric acid 1.0 part by wt.

A working concentration of about 30% is often used, this can be prepared by dissolving 177 parts by wt. of pentahydrate borax and 150 parts by wt. of boric acid in 1,000 parts water, which should be kept at 35°C. to prevent any crystallisation taking place.

Sometimes green moulds, *Penicillium spp.* appear on the treated timber during storage after immersion and to prevent this mould growth, which is actually harmless to the timber but looks unpleasant, 4 parts of sodium pentachlorophenate may be added to 1,000 parts of the solution. The timber can be treated by passing individual pieces through a spray tunnel or by immersing bundles of pieces in a tank. The timber after treatment must be kept under conditions that prevent drying so that the chemicals can diffuse throughout the thickness of the pieces. This can easily be achieved by block piling the wood and covering the stack with a tarpaulin.

The ultimate overall retention of dry salts at which one should aim is 0.8 gm. per 100 gm. of oven dry wood. Since the film of liquid left on the surface of the wood after dipping is about 0.2 mm. thick one can calculate the concentrations required for the treatment of timber. From practical experience, it has been found the following concentrations give satisfactory results:

Density of Wood	*Concentration wt./vol. Boric Acid*	
	Boards 2.5 *cm. thick*	*Boards* 5 *cm. thick*
0.3	20	25
0.4	20	32
0.5	25	40

Diffusion times vary according to the density and thickness of the wood; for example pine sapwood 2.5 cm. thick requires 3 weeks, 5 cm. requires 8 weeks while denser timbers require rather longer periods.

Success of diffusion treatment depends on:

1. Treatment of fresh 'green' timber only.
2. Correct choice and accurate control of solution strengths.
3. Protection against drying out and leaching during storage.
4. Adequate time for diffusion.

Cost of Treatment

The chemicals used are very much cheaper than most other water borne wood preservatives, boron compounds for wood preservation generally cost less than 1/0d. per lb. No expensive impregnating plant is required to apply

TABLE 2

'Laboratory Leaching and Decay Tests on Pine and Oak Blocks Treated with Several Preservative Salts'

Threshold Concentrations of Inorganic Chemicals in Pine and Oak ¾-inch Cube Blocks (Soil Block Tests)

Preservative Chemical in Kg/m³

Species of Wood—Pine	Sodium Borate	Sodium Fluoride
Lentinus lepideus	1.283—1.933	1.400— 2.183
Lenzites trabea	1.283—1.983	2.616— 3.116
Poria monticola	0.617—1.299	2.616— 3.033
Species of Wood—Oak	**Sodium Borate**	**Sodium Fluoride**
Polyporus versicolour	1.766—2.966	14.06 —23.49
Lenzites trabea	1.782—2.949	2.632— 5.065
Poria monticola	0.750—1.066	2.449— 4.099

TABLE 3

'Toxicities of Some Water-Borne Wood Preservatives to Wood Destroying Fungi'

Minimum Toxicity Levels—(Soil Block Tests) Kg/m³

Preservative	Test Fungi		
	C. cerebella	*P. vaporaria*	*L. trabea*
(1)Boric Acid	0.6—1.2	0.6—1.2	1.2—1.8
(2)Borax	1.8—2.4	1.8—2.4	1.8—2.4
(3)Fluor. Chrome arsenate-phenol	0.6—1.2	3.6—6.0	3.6—6.0
(4)Copper-zinc-chrome-arsenate	0.6	1.2—2.4	1.2—2.4
(5)Zinc-chrome-arsenate	0.6—1.2	1.8—3.0	2.9—5.4
(6)Acid copper chromate	7.2	7.2	3.6—6.0
(7)(Acid copper chromate 80% + Boric Acid 20%)	2.4—4.2	2.4—3.6	2.4—3.6

boron preservatives, so that it is possible to supply fully impregnated timber at a cost which is considerably lower than that treated by impregnation in a pressure cylinder.

Advantages of Boron for Wood Preservation

1. Boron is equally effective against fungi and insects, being at least as toxic as sodium fluoride to these organisms.
2. Boron is harmless to man and animals.
3. Boron is non-corrosive.
4. If correctly formulated so that the pH does not exceed 7.5 boron solutions are quite harmless to all timbers.
5. Boron is cheap.

It seems therefore that boron compounds possess all the advantages of fluorides without introducing the health hazards that are associated with the use of fluorides, or the corrosion action of silicofluorides.

Applicability of Boron Treatments in Central Europe

It is considered that there should be advantages in applying boron compounds by diffusion processes in Central Europe for the following reasons.

1. Much of the timber requiring treatment is spruce that is not readily penetrated in ordinary impregnation methods.

2. Treatment can be carried out locally in the areas where the trees are grown—thus reducing the transport charges that have to be incurred when the timber has to be transported to impregnating plants in industrial areas.

3. The treatment adequately protects, the *whole of the cross section* of building timbers against insect (*Hylotropes*) and fungal attack giving very much more effective and permanent protection than is afforded by any superficial treatment of a liquid applied by spraying or brushing on to dry timber.

Use of Boron Against Sapstain

There are many reports in the older literature of the successful use of borax solutions for the protection of susceptible hardwood such as sap gum (*Liquidambar styraciflua*) against sapstain during seasoning. Today a solution of sodium pentachlorophenate is the most widely used fungicide for this purpose, but it is often found both economical and advantageous to use a mixture of sodium pentachlorophenate and borax. Firstly, the cost of the mixture is less than that of the higher concentration of sodium p.c.p. required when the latter is used alone, and borax acts as a buffer and enables uniform and even distribution of sodium p.c.p. on the wood surfaces. Sodium borate reinforces the performance of sodium p.c.p., at the same time reducing the cost of the treatment. Secondly, the mixed solution is less irritating to the skin of the operator's hands than straight sodium p.c.p. solution.

The concentrations generally used vary according to climatic conditions, timber size, etc., but the following are typical:

1. For temperate countries:

Borax	$5\frac{1}{2}$ kg.
Sodium p.c.p.	2 kg.
Water	450 litres

2. For tropical conditions:

Borax	9 kg.
Sodium p.c.p.	9 kg.
Water	450 kg.
Benzene hexachloride dispersable powder (to prevent pinhole borer attack)	34 kg.

REFERENCES

[1]Blew, J. O. et al, (1949). Post Service Records, Rep. Comm. U-5 Proc. A.W.P.A. 45. 255-293.

[2]Findlay, W. P. K. (June 1956). 'The Toxicity of Borax to Wood-rotting Fungi'. *Timber Technology and Machine Woodworking*. **61,** 275-6.

[3]Cummings, J. E. (1938). 'Recommendations for the Commercial Treatment of Green Veneer to Render it Immune from Attack by the Powder Post Beetle'. *Aust. Tim. J.* **4,** 661-667.

[4]Harrow, K. M. (1950). 'Toxicity of Water-Soluble Wood Preservatives to Wood Destroying Fungi'. *N.Z.I. Sci. Tech.* **B.31,** No. 5.

[5]Cummins, J. E., and Wilson, H. B. (1936). 'The Preservation of Timber against the Attacks of the Powder Post Borer by Impregnation with Various Chemicals'. *J. Counc. Sci. Ind. Res. Aust.* **9,** p. 37-56.

[6]Cummins, J. E. (1939). 'The Preservation of Timber Against Attack of the Powder Post Beetle. *J. Counc. Sci. Ind. Res. Aust.* **12.**

[7]Spiller, D. (1948). 'Toxicity of Boric Acid to the Common House Borer'. *N.Z. J. Sci. Tech.* **B.29,** 22-23.

[8]Spiller, D. (1950). 'A Note on the Toxicity of Boric Acid to Larvæ of the Two-toothed Longhorn, Ambeodontus tristis'. *N.Z.J. Sci. Tech.* **B.33.** 447-459.

[9]MacNulty, B. J., and Wilkinson, W. (1958). 'Borax Resistance of Treated Wood to Termite Attack'. U.K. Ministry of Supply Tropical Testing Establishment, Port Harcourt, Nigeria.

[10]Gay, F. J., Harrow, K. M. and Wetherly, A. H. (1958). 'Laboratory Studies of Termite Resistance III — A Comparative Study of the Anti-termitic Value of Boric Acid, Zinc chloride and Tanalith U.

[11]Baechler, R. H. and Roth, H. G. (1956). 'Laboratory Leaching and Decay Tests on Pine and Oak Blocks'. *A.W.P.A. Proceedings*, 1956. **52,** 24-33.

[12]Carr, D. R. (1957). 'Toxicities of Some Water-Borne Wood Preservatives to Wood Destroying Fungi'. Unpublished report.

ARSENIC IN POTATOES—*Minister's Reply*

ON the 19th February, 1960, a Sunday Newspaper—**"The People"** entered the ranks of the anti-chemical brigade. A Mr. John Justice used up nearly half a page saying that potatoes now on sale contained arsenic in proportions which were dangerous to human health. He condemned manufacturers of agricultural chemicals and farmers who used arsenical haulm destroyers as money-grabbers who were determined to rake in their profits with a total disregard for the public safety. He condemned the Ministry of Agriculture, Fisheries and Food—and thus the scientists who work for the Ministry as dithering idiots who either knew nothing of the effect of arsenical haulm destroyers or were frightened of opposing the Agricultural Chemical industry. How unjust can Mr. Justice get?

In the House of Commons, 25th February, 1960, Mr. John Eden, M.P., a noted antagonist of agricultural chemicals asked the Minister of Agriculture, Fisheries and Food, The Rt. Hon. John Hare, O.B.E., M.P., what evidence he has received regarding the presence of dangerous amounts of arsenic in the peel of potatoes which have been treated with arsenical haulm killers, and whether he will make a statement. In a written reply, the Minister said:—

> "Where arsenic is found in potatoes, the peel normally contains more arsenic than the flesh; but surveys organised by the Ministry of Health in 1958 and analysis of samples of tubers from sprayed crops taken by the National Agricultural Advisory Service in 1959 have indicated that the residues would **not** be dangerous to public health.
>
> Moreover there are stringent statutory limits to the amount of arsenic which may be in any food including home grown and imported potatoes as sold".

It would be as well for Mr. John Eden, M.P., Mr. John Justice and others to note the following facts.

The Arsenic in Food Regulations, 1959 (831), paragraph 3 (1), require that ". . . . save as hereinafter provided no food shall contain arsenic in proportions exceeding one part per million (estimated by weight of such food)". This paragraph applies to home-grown and imported potatoes.

The Ministry of Health organised in the spring of 1958 a nation-wide investigation into the arsenic content of potatoes offered for sale to the public. Forty-eight local authorities in England, Scotland and Wales co-operated. A total of 450 samples of potatoes were examined. Although in 21 samples more than one part per million of arsenic were found in the peel, *in only four samples did the amount of arsenic in the whole potato exceed one part per million,* i.e. two samples showed arsenic at 1.1 parts per million and two at 1.2 p.p.m.

Samples taken by the N.A.A.S. in 1959 showed *no* case where the residue of arsenic in whole potatoes reached one part per million. These samples were taken in the South Eastern, Eastern, South Western and Yorks. and Lancs. Regions. *The samples included potato from plots treated with arsenite haulm killers.*

Arsenic occurs naturally in the ground. Soil from potatoes grown in ground known to have received no arsenical sprays has been found to contain as much as 15 parts per million of arsenic.

The voluntary agreement to withdraw alkali arsenites from use after the 1960 potato harvest was based mainly on the potential risks to unprotected people *in the vicinity of spraying, and to cattle and wild life.* The most stringent safety precautions will be observed in this final season to minimise these risks. The extra period will be very valuable for the commercial development of suitable substitutes.

P.S. How many people eat potato peel on its own?

NOTE ON THE APRIL ISSUE

Three Press Conferences of note are to take place in March and *Pest Technology* will have a representative present to report any important announcements.

In chronological order these conferences are:—8th March, 1960, Charing Cross Hotel, a press conference called by Dow Agrochemicals Ltd. concerning the future marketing of Dowpon (a dalapon formulation) in 4 oz. packs suitable for the amateur gardener and other small growers.

10th March, 1960, Dorchester Hotel, Baywood Chemicals Ltd. are to announce the release of Guthion (or Gusathion as it will be known in this country) onto the U.K. market. This chemical has been very successful in the U.S.A. and other overseas countries, and it is a product of the research of Farbenfabriken Bayer A.G.

15th March, 1960, Waldorf Hotel, the Association of British Manufacturers of Agricultural Chemicals will hold a press conference and exhibition to demonstrate the positive and essential role played by agricultural chemicals in greatly increasing world food production and in curbing attack by insect pests and diseases on plant and vegetable life.

Information concerning these conferences will be given in our April issue, together with our usual articles and news items.

PEOPLE AND PLACES

New Chairman for Ronuk Ltd.

Mr. C. E. M. Hardie, O.B.E., has been appointed Chairman of Ronuk Limited. He succeeds Mr. P. W. Felton who has been Chairman for the past 15 years. Mr. Felton will continue as a member of the Board.

Mr. Hardie is a director of many well known companies and joined the Board of Ronuk a year ago.

Borax Consolidated Appoint New Manager

Borax Consolidated Limited have pleasure in announcing the appointment of Mr. G. N. Blow as their Midlands Area Manager in succession to the late Mr. D. G. B. Sleath. Mr. Blow has been with the Company since 1953 as a local representative in the Birmingham Area.

Toxic Chemicals in Agriculture—Research Study Group

In a written reply to Mr. Holman, M.P., Mr. J. B. Godber, M.P., Parliamentary Secretary to the Ministry of Agriculture, Fisheries and Food, said:

"My Right honourable Friend, together with the Minister of Science, the Secretary of State for Scotland and the Minister of Health, have appointed nine members of this Group, under the chairmanship of the Chief Scientific Adviser on Agriculture to the Ministry, Professor Sanders".

The following are the names:—

Chairman:

Professor H. G. Sanders, M.A., Ph.D.
Chief Scientific Adviser (Agriculture), Ministry of Agriculture, Fisheries and Food.

Members:

Dr. H. R. Barnell, M.A., Ph.D., B.Sc., M.I.Biol.
Chief Scientific Adviser (Food), Ministry of Agriculture, Fisheries and Food.

Dr. J. M. Barnes, B.A., M.B.
Director, Toxicology Research Unit, Medical Research Council.

Professor A. R. Clapham, M.A., Ph.D., F.R.S.
Professor of Botany, Sheffield University.

Dr. R. A. E. Galley, Ph.D., A.R.C.S., D.I.C., F.R.I.C.
Director, Tropical Products Institute, Colonial Office. Officer-in-charge, Colonial Pesticides Research.

Mr. C. O. Harvey, B.Sc., A.R.C.S., F.R.I.C.
Laboratory of the Government Chemist, Department of Scientific and Industrial Research.

Dr. Donald Hunter, C.B.E., M.D., F.R.C.P.
Physician to London Hospital and part-time Physician-in-charge, Department for Research in Industrial Medicine, London Hospital.

Mr. W. C. Moore, C.B.E., M.A.
Director, Plant Pathology Laboratory, Ministry of Agriculture, Fisheries and Food.

Professor W. L. M. Perry, O.B.E., Ch.B., M.D.
Professor of Materia Medica, Edinburgh University.

Mr. G. G. Samuel, M.Sc.
Scientific Staff (Headquarters) Agricultural Research Council.

As announced in the House of Commons on 14th December, 1959, the Group's terms of reference are:—

"To study the need for further research into the effects of the use of toxic chemicals in agriculture and food storage, and to make recommendations".

This Study Group is independent of the interdepartmental Advisory Committee on Poisonous Substances used in Agriculture and Food Storage, which will continue.

New General Manager for Griffin & George Subsidiary

Mr. R. E. F. Sykes, Associate Member of the Institution of Works Managers, has been appointed General Manager of Griffin and George (Laboratory Construction) Ltd., with works at Perry Barr, Birmingham, and Mitcham, Surrey, a subsidiary of the Griffin and George Group, Ealing Road, Alperton, Wembley, Middlesex, manufacturers and suppliers of scientific instruments and equipment for every field of research, development and test in industry and for all types of educational establishment.

Mr. Sykes succeeds Mr. A. E. Lambert, who has retired from the Company, which manufactures laboratory furniture in wood and metal.

Marchon Staff Appointments

Mr. O. Secher, Sales Director of Marchon Products Limited, has announced the following appointments:

Mr. R. D. Cribb has been appointed Sales Manager of Solway Chemicals Limited.

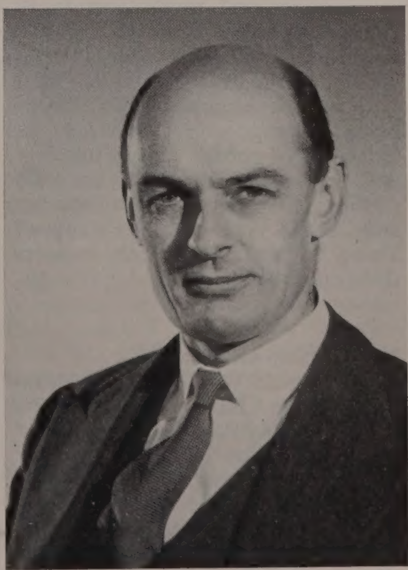
Mr. B. Milling has been appointed Sales Research Officer. His main function will be the promotion of Marchon's existing surfactants and chemical auxiliaries, towards their use in industries outside those already served. He will be responsible to Mr. M. Dufaye, Sales Controller-Commercial.

Mr. J. M. Bromley, responsible to Mr. A. Taylor, the Sales Controller-Technical, continues in his position as Sales Service Manager.

Miss I. T. MacInnes will act as assistant to Mr. O. Secher in all matters connected with Public Relations and Advertising.

New Sales Manager for Celcure Limited

Lt. Col. P. J. T. Skipwith has been made Sales Manager of Celcure Limited. He joined the Company early in 1958 following his retirement from the Army. Educated at Shrewsbury School his Army Service in the Royal Artillery included two appointments in the Far East, as well as Cyprus and more recently in Germany.



Lt. Col. P. J. T. Skipwith

PEOPLE AND PLACES ———

Congratulations

Our congratulations go to Frank Jefkins upon the publication of his novel "*Wanted on Holiday*" by Hodder and Stoughton. The novel is described as a suspense story about a man, on holiday with his wife and son, who is horrified to realise that the police are hunting for him in connection with a crime he cannot prove he did not do.

Frank Jefkins is a man of many parts, for in May 1958 his advertising text-book "Copywriting and its Presentation" was published by Crosby Lockwood. He is of course known to us as the Publicity Manager of the British Ratin Group whereby he handles the public relations for a number of Woodworm and Dry Rot and Pest Advisory Centres throughout the country including the palatial Centre at 16, Dover Street. In connection with his occupation he writes articles on pests and pest control for numerous magazines and is also the editor of the company's staff magazine "Felcourt Newsletter".

Rumour has it that Frank Jefkins' next effort will be in the science fiction field, and concerns an Egyptian Pharoah who, whilst entombed in his pyramid these thousand years, uses ancient and mystic lore (a la Dennis Wheatley) to breed a savage horde of ants and other insects, which upon release threatens to send civilization crumbling to dust. Eventually a group of scientists (a la Quatermass) put their heads together and, by using modern scientific methods, destroy the anthropod army and thwart the mummy's plans. There is no evidence to support these rumours.

N.F.U. New Officers

Mr. Harold Woolley, C.B.E., who farms in the Cheshire Plain and is a former Deputy President, was elected President of the National Farmers' Union of England and Wales at a meeting of the N.F.U. Council in London on Thursday, 28th January.

Col. H. J. Wilson, O.B.E., T.D., who farms at Robertsbridge, Sussex, was re-elected Deputy President.

Mr. G. T. Williams, who farms in Shropshire, was elected Vice-President.

Mr. Woolley succeeds Lord Netherthorpe, who has held the office of Presidency for 15 years. Last August Lord Netherthorpe announced that he would not be seeking re-election in 1960.

Fison Farmwork

The Chairman of Fisons Farmwork Limited, the new subsidiary company of Fisons Pest Control Ltd., will be Dr. E. Parry Jones. Mr. R. F. Norman will be the Managing Director and Mr. F. W. Morris and Mr. C. J. Edwards are to be the other directors.

It may be remembered that Fisons Farmwork Ltd. has been set up to take over all the contracting work that used to be done by Fisons Pest Control Ltd. The contracting work covers aerial and ground crop spraying, spreading, drainage etc. and also industrial spraying for the control of unwanted vegetation on oil refineries, timber yards and other industrial sites.

There will be thirteen branches of the new company situated mainly in the Eastern half of Great Britain. Each branch will be self contained, and under the direction of a manager chosen for his local knowledge. V.H.F. radio-telephones will be used for communication between the field units and branch headquarters.

Cash Awards for Designers of Humane Traps—Appointment of Awards Panel

A Panel has been appointed to advise on awards to inventors whose original designs have led to the development of humane traps, which came into general use after the ban on gin traps became effective. The awards will be made from a fund of up to £5,000.

The members of the Panel are, Chairman, Mr. J. Scott Henderson, Q.C., Recorder of Portsmouth, and former member of the Advisory Committee on Myxomatosis and Chairman of the Committee on Cruelty to Wild Animals, Mr. W. A. T. Matheson, F.C.A., a Chartered Accountant with Messrs. Finnie, Ross, Welch and Company, and representing Scottish interests, and Mr. R. B. Verney, who is Chairman of the Executive Committee and Deputy President of the Country Landowners' Association in addition to being a member of the Advisory Council on Rabbit Clearance and Chairman of the Humane Traps Panel. The Secretary will be Mr. N. H. White, who is in charge of the Ministry's Infestation Control Division, Tolworth, Surbiton, Surrey.

Appointment of Deputy Chief Veterinary Officers

Mr. John Reid, M. R. C. V. S., D.V.S.M., and Mr. A. G. Beynon, M.R.C.V.S., D.V.S.M.(Vict.), have been appointed Deputy Chief Veterinary Officers of the Ministry.

Mr. John Reid will succeed Mr. A. D. J. Brennan, C.B.E.,M.R.C.V.S. who will be retiring on 31st March, 1960 and Mr. Beynon will succeed Mr. L. Hughes, C.B.E., M.R.C.V.S. who will be retiring later this year.

Mr. Reid, who is aged 53, is at present a Regional Veterinary Officer at the Ministry's Animal Health Division headquarters at Tolworth, Surrey. He was educated at McLaren High School, Callender, Perthshire and at the Royal (Dick) Veterinary College, Edinburgh. Before entering the Ministry in 1938 he was employed as Assistant County Veterinary Officer by the Midlothian and later the Cumberland County Councils.

Mr. Beynon, aged 52, is at present Regional Veterinary Officer for Wales and Monmouth stationed at Aberystwyth. Educated at Llanelly County School and the Royal Veterinary College, London, he took the course of the Diploma of Veterinary State Medicine at Manchester University. He joined the Ministry in 1932.

Government Chemists Appointed to Journal's Advisory Board

Three Government chemists, two of them from Maryland, have been appointed to the advisory board of the *Journal of Agricultural and Food Chemistry*, monthly publication of the American Chemical Society, it is announced by C. B. Larrabee of Washington, D.C., director of publications of the Society's applied journals.

The new board members are: Dr. O. L. Kline, director of the division

of nutrition of the Food and Drug Administration, Washington, D.C.; Stanley A. Hall, chief of the pesticide chemicals research branch of the United States Department of Agriculture, Beltsville, Md., and John O. Hardesty, senior chemist in charge of the mixed fertilizer section of the U.S.D.A.'s Soil and Water Conservation research division, Beltsville.

The advisory board consists of 18 members, serving three-year terms, who meet several times a year to consult with and advise the editors.

Cyanamid's Expanding Veterinary Interests

Cyanamid of Great Britain Ltd., are planning to expand their veterinary interests in the United Kingdom, and have announced the introduction of a Veterinary Sales Force. The existing range of Aureomycin and Achromycin veterinary products will be extended and investigation has already begun into the use in this country of a number of other veterinary products.

The new Veterinary Representatives are responsible to Mr. E. G. Baldwin, who is already well known to Scottish and Northern Ireland veterinarians. They have recently completed an intensive training programme under veterinary members of the Agricultural Division's Applied Research and Advisory Department. Part of this training programme was perhaps unique in that each representative spent a period working in the field in a veterinary practice.

Appointment of Committee of Enquiry on Fowl Pest

In an oral reply to a question by Sir Richard Nugent, M.P., in the House of Commons the Minister of Agriculture, Fisheries and Food, the Rt. Hon. John Hare, O.B.E., M.P., announced that it is the intention of the Secretary of State and himself to appoint a Committee of Enquiry with the following terms of reference:—

"To review the policy and arrangements for dealing with fowl pest in Great Britain, and to advise whether any changes should be made in the light of the growth of the poultry industry, present scientific knowledge and technical and administrative experience gained in recent years in this and other countries."

The Minister said he would inform the House in due course of the membership of the Committee.

NEWS

Fertilizer Society

The next meeting of the Society will be held on Thursday, 31st March, 1960 at 2-30 p.m. in the Lecture Hall of the Geological Society, Burlington House, Piccadilly, London, W.1, when there will be presented a paper entitled "Rotary coolers and driers: some related aspects of design" by S. J. Porter, B.Sc., M.S., F.R.I.C., M.I.Chem.E. and W. G. Masson, B.Sc. The paper will be followed by a discussion.

Guests will be welcome if introduced by a member.

Simazine as a Selective

This journal has previously suggested that Simazine, the highly successful total weedkiller manufactured by J. R. Geigy S.A. would prove successful as a selective weedkiller in certain crops. Now Fisons Pest Control Ltd., who, by arrangement with J. R. Geigy, manufacture and market simazine in the U.K. and certain other territories, have announced that a formulation of this chemical will be available this year for the selective control of both broadleaved and grassy weeds in apples, pears, bush and cane fruit, asparagus and maize. Application at the recommended rate of 2 lb./acre for light soils or 3 lb./acre for heavy soils is reputed to give freedom from weeds for several months.

For the overseas grower Fisons Pest Control have also recommended this 50% simazine formulation to give safe and persistant weed control in tropical plantation crops such as pineapples, sugar cane, sisal, tea, coffee, rubber, citrus, soft fruits, vines, rice, tapioca and hybrid sorghums. It is not recommended for cotton, tobacco, stone fruits, soya beans or ground nuts.

From previous accounts which have appeared in *Pest Technology* readers will no doubt be aware that, simazine must be applied to the soil before the weeds grow; it presents no crop residue problem; it is harmless to livestock, game and man, and that its low solubility will prevent it from ' creeping ' to susceptible crops or being leached to the roots of woody plants for which it has been recommended.

A.B.M.A.C. Extends Scope of Membership

During the past year the Association of British Manufacturers of Agricultural Chemicals has been revising its Rules to bring them more into line with present day conditions and at meetings of the Association held in November, 1959, the revised Rules were formally accepted.

Previously membership of the Association was limited to firms manufacturing crop protection chemcals in the United Kingdom. However, there are a number of firms who did not fall within the rigid definition of "British" in the old Rules although their products are marketed and, in some cases, even manufactured in this country. Moreover, the interests of these firms in the pesticide industry have greatly increased since the developments in the Common Market.

In revising the Rules the Association whilst retaining the old class of membership decided to create a new class of Associate Membership in order to permit firms, manufacturing crop protection chemicals in some other country and selling them on a substantial scale in the United Kingdom, to become members of the Association. It is believed that all those companies which are off-shoots of foreign companies but which are now manufacturing pesticides in this country either directly or under licence, will seek membership of the Association.

A.B.M.A.C., will no doubt benefit from the revision in the Rules in that it will be more representative of the industry. However, except for the fact that Associate members cannot vote or hold office within the Association, the service provided to the two classes is similar. Therefore, the greater benefit will be to the new members since the Association is the negotiating body for the industry and pronouncements by the Government to the industry are made through the Association who automatically keeps members informed of such pronouncements.

It is possible to transfer from Associate Member to Full Member if the requisite conditions are fulfilled. The conditions for eligibility to Full Membership are that a firm must manufacture in the United Kingdom or have full technical control over the manufacture in the United Kingdom of reputable crop protection chemicals.

NEWS

Post Graduate Studentships

The Ministry of Agriculture, Fisheries and Food and the Department of Agriculture for Scotland propose to award for the academic year beginning 1st October, 1960, a limited number of post graduate studentships in the various branches of husbandry (including horticulture), farm management, agricultural or horticultural economics (including rural estate management), agricultural or horticultural statistics, agricultural and dairy engineering and agricultural science.

Post graduate awards are also offered by the Agricultural Research Council, Cunard Building, 15 Regent Street, London, S.W.1, for training in research. These are open to graduates in science, and graduates in agriculture or horticulture who have shown a special interest in one of the basic sciences. Applications for awards in veterinary science should be made to the Agricultural Research Council.

The number of awards offered by the Ministry was increased in 1958 so that it is no longer necessary for the Ministry of Education to extend State Scholarships or to supplement College and University awards for post graduate study in agricultural subjects, nor for Local Education Authorities to make awards.

Applicants normally resident in England, Wales and Northern Ireland can obtain further particulars and forms of application from the Ministry of Agriculture, Fisheries and Food, Room 282A, Great Westminster House, Horseferry Road, London, S.W.1. Applicants normally resident in Scotland should apply to the Department of Agriculture for Scotland, St. Andrew's House, Edinburgh, 1.

The closing date for receipt of completed application forms is 31st March, 1960.

Awards are also available to post - graduate and post - doctoral students of agricultural science under the NATO Science Studentships and Fellowship Programme, which is intended to stimulate the exchange of students between member countries of the North Atlantic Treaty Organisation. The scheme is administered for U.K. students by D.S.I.R., Charles House, 5-11 Regent Street, London, S.W.1, to whom applications should be made.

Warble Fly

Stock owners are reminded of their legal responsibilities during the warble fly dressing season, which begins on 15th March. From now until the end of June the backs of all cattle must be regularly inspected for swellings caused by warble fly maggots lying just under the skin: particular attention should be given to outlying stock. It is not sufficient to rely on visual inspection: in long-haired cattle infestation can often only be detected by touch. The specified derris dressing should be applied to the back of infested cattle by scrubbing with a stiff brush, and dressings must be repeated at monthly intervals until maggots cease to appear, or until 30th June, whichever is the earlier. The use of systemic insecticides last autumn, which may not be fully effective, does not absolve stock-owners from their obligations under the Order to inspect and dress their cattle if and when warble swellings appear.

Silica Aerogels for the Control of Resistance Mites

During 1959 it was reported that the Pacific mite on grapes was showing increasing resistance to standard mites. As a result of this research is being carried out by the Department of Entomology and Parasitology, University of California, Davis, to determine whether the Pacific mite can be controlled by silica aerogels (see *Pest Technology*, October, 1959).

The silica aerogels are marketed as very small particles of silicon dioxide, which in this finally divided state are very absorbtive and absorb the lipoid factors in the insect cuticle. Thus the insects lose water and die of desication.

It is claimed that insects will not be able to develop resistance to these compounds as their mode of action is mechanical. Whether they will be effective in controlling the Pacific mite, is the subject of an investigation, which will be continued to find the most effective method of application, if the silica aerogels give promising results.

Export of Plants and Seeds

Nurserymen who are interested in the export of nursery stock, bulbs, seeds, etc., are reminded that before the Ministry of Agriculture, Fisheries and Food can issue the health certificates which certain countries require as a condition of import, one or all of the following requirements may be necessary:—

(1) inspection of consignments immediately prior to export;
(2) crop inspections during the growing season;
(3) soil sampling and testing for Potato Root Eelworm.

An increasing number of countries are now requiring inspection of plants during the growing season in addition to an examination immediately before shipment. Health certificates will not be issued for apple trees, gooseberry and currant bushes, hop sets and cuttings (for most countries) and chrysanthemums (for all countries) unless the stocks have been inspected during active growth.

Soil sampling and testing for Potato Root Eelworm is also required at present before plants can be exported to Algeria, Canada, Denmark, the Federal Republic of Germany, Finland, Jamaica, Poland, Sweden, Turkey, U.S.A. and (for certain plants) Northern Ireland and Israel.

The Ministry is prepared to advise growers who anticipate exporting planting material (including plants grown to produce seed for export), and early application for a growing season inspection or for further information should be made to Plant Health Branch, Ministry of Agriculture, Fisheries and Food, Whitehall Place, London, S.W.1.

Import of Raw Vegetables

In an Order, made by the Minister of Agriculture, Fisheries and Food the importation into England and Wales of certain raw vegetables (excluding potatoes) from parts of Belgium, France, Holland and Italy will again be permitted, under modified conditions of entry, during specified periods of this year. The specified periods have been calculated so as to permit import when Colorado beetles are least active in the areas concerned.

The Order, which came into operation on 1st March, provides alternative safeguards against Colorado Beetle in respect of certain raw vegetables imported from specified districts only.

The Order, entitled the Importation of Raw Vegetables Order, 1960 (S.I. 1960 No. 184), has been made under the Destructive Insects and Pests Acts, London, W.C.2, and is obtainable from any bookseller, price 3d. (by post 5d.).